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(54) [Title of the Invention] ALKALINE BATTERY ZINC ALLOY POWDER, AND
MANUFACTURE THEREOF

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(57) Abstract

[Purpose] To provide an alkaline battery zinc alloy powder, with low cost and good fluidity, using which an injection nozzle can be prevented from clogging when supplying gel into a cell, and which has excellent quantifiability properties, that can be obtained by reforming the surface of zinc powder, and a manufacturing method thereof.

[Constitution] Powder is formed by employing compressed air using an atomizing method from a melt of molten zinc with a purity of 99.995% or greater to which additive components are added to a specified content, and the zinc alloy powder obtained is classified as 100 to 200 mesh. To this powder, afterwards, isopropyl alcohol, in which stearic acid is dissolved at 0.0005 to 0.1 part by weight with respect to isopropyl alcohol at 1 part by weight, is added and mixed at 1.0 part by weight to zinc alloy powder at 100 parts by weight, and is dried afterwards, so that the stearic acid attaches to the surface of the power. Zinc alloy powder thus obtained has excellent fluidity of 33-40sec/50g by JIS Z2502.

[Scope of Claims]

[Claim 1] An alkaline battery zinc alloy powder, which is atomized from a melt of refined molten zinc alloyed with additive metal components, wherein the surface is treated using stearic acid at 0.0005 to 0.1 part by weight to said zinc alloy powder at 100 parts by weight.

[Claim 2] An alkaline battery zinc alloy powder according to claim 1, wherein said zinc alloy powder is alloyed with the addition of at least one or more components selected from Al, Bi, In and Pb.

[Claim 3] An alkaline battery zinc alloy powder according to claim 2, wherein the contents of said alloyed components are; Al at 0.001 to 0.01 percent by weight, Bi at 0.001 to 0.05 percent by weight, In at 0.01 to 0.1 percent by weight, and Pb at 0.01 to 1.0 percent by weight.

[Claim 4] A manufacturing method of an alkaline battery zinc alloy powder in which powder is formed from a melt of refined molten zinc alloyed with additive metal components using an atomizing method, wherein after a solution in which stearic acid is

dissolved in an organic solvent is added to and mixed with zinc alloy powder, the organic solvent is volatilized and dried by heat or under reduced pressure, and thus the stearic acid attaches to the surface of said zinc alloy powder.

[Detailed Description of the Invention]

[0001]

[Field of Industrial Application] The present invention relates to a zinc alloy powder, which serves as a negative electrode agent (negative electrode active material) of an alkaline battery, and a manufacturing method thereof.

[0002]

[Prior Art] Heretofore, zinc or zinc alloy powder has been used for the negative electrode agent of a battery such as an alkaline dry cell. Since zinc has high hydrogen overvoltage, and its price is comparatively low, it is used preferably as a negative electrode agent.

[0003]

This zinc alloy powder is mixed with an electrolyte and a gelling agent to form a gel zinc negative electrode agent, which is afterwards injected into a cell such as a size C type, a size D type or the like, and thus incorporated in an alkaline dry battery. However, there are problems in that in the case where a zinc alloy powder with inferior fluidity is used, the quantifiability properties deteriorate, and in particular in the case where the gel is injected into a small sized cell such as a microcell or the like, the injection nozzle gets blocked.

[0004]

The fluidity of zinc powder is affected by the shape of the particles, and it is known that the greater the shape approximates a sphere, the better the fluidity. However, the shape of the particles of a zinc powder produced in a so called atomizing method in which high pressure gas is injected into a zinc melt to powderize it does not become spherical, and is likely to become fusiform or tear drop shaped because an oxide film produced on the surface of a particle during atomizing increases the viscosity of the droplet. Therefore, the gel zinc negative electrode agent in which zinc powder with such a particle shape is used has a drawback in that the particles become turbulent, increasing the friction, and making it inferior in regards to fluidity.

[0005]

Therefore, in order to obtain zinc powder with excellent fluidity, a range of methods of making the particles spherical have been proposed. Incidentally, it is known

that the shape of zinc powder particles is affected by the atmosphere and the oxygen concentration of the injection gas, and the lower the oxygen concentration, the more approximately it becomes spherical. A method has been proposed of obtaining zinc powder with high fluidity by making the oxygen in the atmosphere 8% or less in order to obtain spherical zinc particles (Japanese Examined Patent Publication No. Sho 60-9081, 9082) [Unexamined Patent Publication Nos. 58-217607, 58-217608].

[0006]

However, although the fluidity can be improved by this method, since it uses an inert gas, and the oxygen concentration must be controlled, expensive equipment is required, and thus inevitably the zinc powder produced becomes expensive. Furthermore, in the case where these particles are used for a gel, although the fluidity of the gel can be improved, the number of points of contact between particles decreases and the surface area of the particles becomes small, so the reactivity becomes poor. Therefore, there is a problem in that in the case where it is incorporated in a battery, the discharge utilization factor drops.

[0007]

Therefore, a method is proposed in which this spherical zinc powder and particles with different shapes, such as a fusiform or tear drop shape, are mixed to form gel zinc negative electrodes (Japanese Unexamined Patent Publication No. Hei 7-254406).

[0008]

However, although this method improves the fluidity of the gel, it can be envisaged that sufficient problems occur such as an increase in the cost due to an increase in the number of processes required to mix two types of zinc powder evenly, and a danger of contamination from the mixing equipment during mixing.

[0009]

[Problems that the Invention is to Solve] As described previously, when zinc powder is incorporated in a negative electrode agent of a dry cell, the quality of the fluidity is important. Both the method of obtaining approximately spherical zinc powder by decreasing the oxygen concentration in the atomizing injection gas, and the method of forming a negative electrode agent by mixing spherical zinc powder with zinc powder with a fusiform or tear drop shape, have advantages and disadvantages. Both of them have problems of a drop in the discharge utilization factor and an increase in the cost.

[0010]

Therefore, the objects of the present invention are to provide an alkaline battery zinc alloy powder, with low cost and good fluidity, using which an injection nozzle can be prevented from clogging when supplying gel, and which has excellent quantifiability properties, that can be obtained by reforming the surface of zinc powder produced by atomization, and a manufacturing method thereof.

[0011]

[Means of Solving the Problem] The present inventors accomplished the present invention by finding, as a result of keen research in order to achieve the above objects, that the fluidity of zinc powder is affected not only by the shape of the zinc powder particles but also by the friction force between the zinc powder particles, and that the sliding properties between zinc powder particles can be improved by attaching stearic acid to the surface of the zinc powder, so that the fluidity of the zinc powder is improved.

[0012]

That is, a first aspect of the present invention is an alkaline battery zinc alloy powder, which is atomized from a melt of refined molten zinc alloyed with additive metal components, wherein the surface is treated using stearic acid at 0.0005 to 0.1 part by weight relative to said zinc alloy powder at 100 parts by weight; a second aspect is an alkaline battery zinc alloy powder according to the first aspect, wherein said zinc alloy powder is alloyed with the addition of at least one or more components selected from Al, Bi, In and Pb; a third aspect is an alkaline battery zinc alloy powder according to the second aspect, wherein the contents of said alloy components are; Al at 0.001 to 0.01 percent by weight, Bi at 0.001 to 0.05 percent by weight, In at 0.01 to 0.1 percent by weight, and Pb at 0.01 to 1.0 percent by weight; a fourth aspect is a manufacturing method of an alkaline battery zinc alloy powder in which powder is formed from a melt of refined molten zinc alloyed with additive metal components using an atomizing method, wherein after a solution of stearic acid dissolved in an organic solvent is added to and mixed with zinc alloy powder, the organic solvent is volatilized and dried by heat or under reduced pressure, and thus the stearic acid attaches to the surface of said zinc alloy powder.

[0013]

[Effects] In the present invention, typical industrial refined zinc is used as a raw material, the zinc is dissolved, and at least one or more alloy components selected from Al, Bi, In and Pb is added to form a zinc alloy.

[0014]

When alloyed with zinc, Al has effects of making the surface of the alloy powder particles smooth, decreasing the surface area associated with reactivity, and retarding the evolution of gas, and Bi, In and Pb have effects of increasing the hydrogen overvoltage of the alloy powder surface and retarding the evolution of gas due to corrosion during **storage of a battery**. It is preferable that these additional elements are incorporated in the constituent range of; Al at 0.001 to 0.1 percent by weight, Bi at 0.001 to 0.05 percent by weight, In at 0.01 to 0.1 percent by weight, and Pb at 0.01 to 1.0 percent by weight. If they exceed those ranges, there are cases in which the effect is small or a sufficient effect is not manifested.

[0015]

In the present invention, by attaching stearic acid to the surface of a powder atomized after a predetermined amount of specified elements has been mixed in and dissolved to be alloyed, it is possible to obtain zinc alloy powder with improved fluidity, and to use it as a negative electrode active material for an alkaline battery.

[0016]

In order to improve the fluidity of the zinc alloy powder, it is effective to add stearic acid, which is attached to the surface of the zinc alloy powder, at 0.0005 to 0.1 part by weight to the zinc alloy powder at 100 parts by weight.

[0017]

It is surmised that the reason that the fluidity can be improved by attaching stearic acid to the surface of the zinc alloy powder is that it acts as follows. The friction force between the particles is a major contributor to the fluidity of the zinc alloy powder. Therefore, decreasing the friction force on the surfaces of the particles is a key point in improving the fluidity. The surface of the zinc alloy powder produced using the atomizing method has an oxide film and is uneven, which is a cause of the friction force among the particles increasing.

[0018]

Stearic acid is a straight-chain type fatty acid having carboxyl groups as hydrophilic parts, and alkyl groups as lipophilic parts. In the case where a solution in which stearic acid is dissolved in an organic solvent, such as isopropyl alcohol, is added to and mixed with zinc alloy powder, and dried afterwards, it appears to attach such that the carboxyl groups, which are the hydrophilic parts, stick to the surface of the zinc alloy powder, and the alkyl groups, which are the lipophilic parts, are located on the outside.

Accordingly, it is surmised that at the contact points between particles, the contacts are made between zinc and alkyl groups, or between alkyl groups and alkyl groups, and the friction force between the particles is reduced due to the high sliding properties of the alkyl groups, improving the sliding properties among the particles, and increasing the fluidity of the zinc alloy powder.

[0019]

In the present invention, the reason that the additional amount of stearic acid is 0.0005 to 0.1 part by weight to zinc alloy powder at 100 parts by weight is that the improvement effect on the fluidity is small at less than 0.0005 part by weight, and if the additional amount exceeds 0.1 part by weight, in the case where it is incorporated in a dry cell, the internal resistance of the battery increases, and hence it has an adverse effect on discharge performance.

[0020]

Hereunder is a further description of the present invention with reference to an example and a comparative example. However, the present invention is not limited to this.

[0021]

[Example] Each of the additional elements was added to and dissolved in a zinc metal melt with a purity of greater than or equal to 99.995% such that the content was as shown in Table 1.

[0022]

Next, this melt was sprayed using an atomizing method employing compressed air as a gas source, and powderized to produce zinc alloy powder.

[0023]

This zinc alloy powder was classified as 100 to 200 mesh, and isopropyl alcohol at 1.0 part by weight, in which a predetermined amount of stearic acid was dissolved, was added and mixed to the zinc alloy powder at 100 parts by weight, and afterwards it was dried by heating to approximately 60°C. The fluidity of the zinc alloy powder obtained was evaluated using the JIS Z2502 method, and the results are shown in Table 1.

[0024]

[Comparative Example] Similarly to the example, each of a number of additional elements were added such that their contents were as shown in Table 1, zinc alloy powder was produced using the atomizing method, it was classified as 100 to 200 mesh, and the

fluidity was evaluated without further treatment similarly to the example. The measurement results are shown in Table 1.

[0025]

[Table 1]

| | Test No. | Composition (ppm) | | | | | Stearic Acid Addition Amount (parts by weight) | Fluidity (seconds/50g) |
|---------------------|----------|-------------------|-----|-----|----|-----------|--|------------------------|
| | | Al | Bi | In | Pb | Zn | | |
| Example | 1 | 30 | 120 | 500 | - | Remainder | 0.0005 | 40 |
| | 2 | | | | | Remainder | 0.0010 | 38 |
| | 3 | | | | | Remainder | 0.0050 | 36 |
| | 4 | | | | | Remainder | 0.0100 | 34 |
| | 5 | | | | | Remainder | 0.0200 | 33 |
| | 6 | | | | | Remainder | 0.0500 | 35 |
| | 7 | | | | | Remainder | 0.1000 | 36 |
| | 8 | | | | | Remainder | 0.0200 | 35 |
| | 9 | | | | | Remainder | 0.0500 | 36 |
| | 10 | | | | | Remainder | 0.0200 | 34 |
| | 11 | | | | | Remainder | 0.0500 | 35 |
| Comparative Example | 12 | | | | | Remainder | Additive-free | 56 |
| | 13 | | | | | Remainder | Additive-free | 66 |
| | 14 | | | | | Remainder | Additive-free | 60 |
| | 15 | | | | | Remainder | Additive-free | 63 |
| | 16 | | | | | Remainder | Additive-free | 56 |

As is clear from the results in Table 1, the flow rate of zinc alloy powder in which stearic acid at 0.0005 to 0.1 part by weight was attached to the surface of the zinc alloy powder at 100 parts by weight was within a range of 33 to 40 seconds/50g. By contrast the untreated zinc alloy powder had poor fluidity, and the flow rate was 56 to 66 seconds/50g.

[0026]

[Effects of the Invention] As described above, using a simple method, the present invention improves the sliding properties of the surface of a zinc alloy powder obtained using an atomizing method in which compressed air is sprayed without controlling the oxygen concentration in the atmosphere, so that a zinc alloy powder with excellent fluidity can be obtained. As a result, when it is used as a negative electrode active material for an alkaline battery, nozzle blockage and a problem of quantifiability properties are solved, which enables the workability in a battery assembly process to be improved significantly.

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(54) 【発明の名称】 アルカリ電池用亜鉛合金粉末およびその製造方法

(57) 【要約】

【目的】 アトマイズして製造された亜鉛粉の表面を改質することにより得られる、低微で流動性が高く、セルにゲル充填の際の注入ノズルの詰まりが防止でき、計量性に優れたアルカリ電池用亜鉛合金粉末およびその製造方法の提供。

【構成】 純度99.995%以上の溶融亜鉛に添加成分を所定の含有量になるように添加した溶融からアトマイズ法により圧縮空気をを用いて粉体化し、得られた亜鉛合金粉末を100~200メッシュに分級した後、この粉末にステアリン酸をイソプロピルアルコール1重量部当たり0.0005~0.1重量部溶解させたイソプロピルアルコールを亜鉛合金粉末100重量部に対して1.0重量部添加混合した後乾燥して粉末表面にステアリン酸を付着させた亜鉛合金粉末は流動性が優れており、JIS Z 2502による流動度が33~40秒/50gである。

【特許請求の範囲】

【請求項1】 精製した溶融亜鉛を添加金属成分で合金化した溶湯からアトマイズされたアルカリ電池用亜鉛合金粉末であって、該亜鉛合金粉末100重量部に対してステアリン酸0.005～0.1重量部を用いて表面処理されてなることを特徴とするアルカリ電池用亜鉛合金粉末。

【請求項2】 前記亜鉛合金粉末がA1、Bi、InおよびPbから選ばれる少なくとも1種以上を添加して合金化されている請求項1記載のアルカリ電池用亜鉛合金粉末。

【請求項3】 前記合金化成分の含有量がA10.001～0.01重量%、Bi0.001～0.05重量%、In0.01～0.1重量%およびPb0.01～1.0重量%である請求項2記載のアルカリ電池用亜鉛合金粉末。

【請求項4】 精製した溶融亜鉛を添加金属成分で合金化した溶湯からアトマイズ法により粉体化するアルカリ電池用亜鉛合金粉末の製造方法において、有機溶剤にステアリン酸を溶解した溶液を亜鉛合金粉末に添加混合した後、加熱あるいは減圧下で有機溶剤を揮発、乾燥することにより該亜鉛合金粉末の表面にステアリン酸を付着させることを特徴とするアルカリ電池用亜鉛合金粉末の製造方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】 本発明は、アルカリ電池の負極剤（負極活物質）となる亜鉛合金粉末およびその製造方法に関する。

【0002】

【従来の技術】 従来、アルカリ乾電池等電池の負極剤としては亜鉛または亜鉛合金粉末が用いられている。亜鉛は水素過電圧が高いことや価格が比較的低廉であることから好んで負極剤として用いられている。

【0003】 この亜鉛合金粉末は電解液およびゲル化剤と混合しゲル状亜鉛負極剤とした後、単3型、単4型等のセルに注入し、アルカリ乾電池として組み込むが、流動性の劣る亜鉛合金粉末を使用した場合、計量性が劣ったり、特に、ボタン電池等の小型のセルにゲルを注入する場合に注入ノズルが閉塞したりする問題があった。

【0004】 亜鉛粉の流動性は粒子の形状に影響され、球状に近いものは流動性が良いことが知られている。しかし、亜鉛溶湯に高圧ガスを噴射して粉化させるいわゆるアトマイズ法において製造される亜鉛粉の粒子の形状は、アトマイズの際に生成する粒子表面の酸化皮膜が液滴の粘性を大きくするため、球状とはならず紡錘状もしくは涙状のものとなり易い。そのため、こうした粒子形状の亜鉛粉を使用したゲル状亜鉛負極剤は、粒子同士が絡み合って摩擦が大きく流動性が劣るという欠点を有していた。

【0005】 そこで、流動性の良い亜鉛粉を得るため、粒子を球状化させる方法が種々提案されている。ところで、亜鉛粉の粒子形状は雰囲気および噴射ガス中の酸素濃度に影響され、酸素濃度が小さいほど球状に近くなることが知られており、真球状の亜鉛粒子を得るために雰囲気中の酸素を8%以下とすることで、流動性の高い亜鉛粉を得る方法が提案されている（特公昭60-9081、9082）。

【0006】 しかし、この方法では流動性は改善されるが、不活性ガスを使用することと、酸素濃度をコントロールするため高価な設備が必要となり、製造する亜鉛粉も高価なものとならざるを得ない。また、この粒子を使用してゲル化させた場合、ゲルの流動性の向上は図れるものの、粒子同士の接触点が減少することおよび粒子の表面積が小さくなるため反応性が乏しくなり、電池に組み込んだ場合、放電利用率が低下するという問題が生じた。

【0007】 そこで、この球状の亜鉛粉と紡錘状もしくは涙状等の異形の粒子を混合しゲル状亜鉛負極を形成するという方法が提案されている（特開平7-254406）。

【0008】 しかし、この方法ではゲルの流動性は改善されるが、2種類の亜鉛粉を均一に混合するための工程が増えることによるコストアップと混合中に混合槽からの汚染の危険性という問題が発生することが十分に考えられる。

【0009】

【発明が解決しようとする課題】 前述の様に、亜鉛粉末を乾電池の負極剤として組み込む際には流動性の良否が重要であり、上記のアトマイズ用の噴射ガス中の酸素濃度を低くして球状に近い亜鉛粉を得る方法も、また球状の亜鉛粉に紡錘状もしくは涙状などの亜鉛粉を混合して負極剤を形成する方法も一長一短があり、それぞれ放電利用率の低下やコストアップといった課題を抱えるものであった。

【0010】 したがって本発明の目的は、アトマイズして製造された亜鉛粉の表面を改質することにより、低圧で流動性が良く、ゲル充填の際の注入ノズルの詰まりが防止され、計量性に優れたアルカリ電池用亜鉛合金粉末およびその製造方法を提供することにある。

【0011】

【課題を解決するための手段】 本発明者らは上記目的を達成すべく鋭意研究の結果、亜鉛粉の流動性が亜鉛粉の粒子形状だけでなく、亜鉛粉粒子同士の摩擦係数に影響し、亜鉛粉表面にステアリン酸を付着させることで亜鉛粉粒子同士の滑り性が改善され、亜鉛粉の流動性が改善されることを見だし本発明に到達した。

【0012】 すなわち、本発明は第1に、精製した溶融亜鉛を添加金属成分で合金化した溶湯からアトマイズされたアルカリ電池用亜鉛合金粉末であって、該亜鉛合金

粉末100重量部に対してステアリン酸0.0005~0.1重量部を用いて表面処理されてなることを特徴とするアルカリ電池用亜鉛合金粉末；第2に、前記亜鉛合金粉末がAl、Bi、InおよびPbから選ばれる少なくとも1種以上を添加して合金化されている上記第1に記載のアルカリ電池用亜鉛合金粉末；第3に、前記合金成分の含有量がAl0.001~0.01重量%、Bi0.001~0.05重量%、In0.01~0.1重量%およびPb0.01~1.0重量%である上記第2に記載のアルカリ電池用亜鉛合金粉末；第4に、精製した溶融亜鉛を添加金属成分で合金化した溶湯からアトマイズ法により粉体化するアルカリ電池用亜鉛合金粉末の製造方法において、有機溶剤にステアリン酸を溶解した溶液を亜鉛合金粉末に添加混合した後、加熱あるいは減圧下で有機溶剤を揮発、乾燥することにより該亜鉛合金粉末の表面にステアリン酸を付着させることを特徴とするアルカリ電池用亜鉛合金粉末の製造方法を提供するものである。

【0013】

【作用】本発明では通常使用される工業用精製亜鉛を原料とし、この亜鉛を溶解し、Al、Bi、InおよびPbから選ばれる少なくとも1種以上の合金成分を添加して亜鉛合金とする。

【0014】Alは亜鉛に合金化することにより、合金粉末粒子表面を平滑にし、反応性に関係する表面積を減少させ、ガス発生を抑制する効果があり、Bi、In、Pbは合金粉末表面の水素過電圧を高めて電池として保存中の腐食によるガス発生を抑制する作用があり、これらの添加元素は、Al0.001~0.1重量%、Bi0.001~0.05重量%、In0.01~0.1重量%、Pb0.01~1.0重量%の成分範囲で含有するのが好ましく、これらの範囲を逸脱した場合は効果が小さいか十分な効果が現れないことがある。

【0015】本発明では所定量の特定元素を混合溶解して合金化した後、アトマイズされた粉の表面にステアリン酸を付着させることで流動性が向上した亜鉛合金粉末を得ることができ、これをそのままアルカリ電池用の負極活物質として用いることができる。

【0016】亜鉛合金粉末の流動性を改善するために亜鉛合金粉末表面に付着させるステアリン酸は亜鉛合金粉末100重量部に対して0.0005~0.1重量部を添加することが効果的である。

【0017】ステアリン酸を亜鉛合金粉末表面に付着させることで流動性の向上が図れるのは、以下の様に作用していると考えられる。亜鉛合金粉末の流動性は粒子同士の摩擦力に寄与する割合が大きく、粒子表面の摩擦力を軽減することが流動性を向上させるポイントとなっ

ている。アトマイズ法で製造された亜鉛合金粉末の表面は酸化皮膜や表面の凹凸があり、これが粒子同士の摩擦力を増加させる原因であった。

【0018】ステアリン酸は親水部としてカルボキシル基を、親油部としてアルキル基を有する直鎖型の脂肪族である。このステアリン酸でイソプロピルアルコール等の有機溶剤に溶解させたものを亜鉛合金粉末に添加、混合後乾燥させた場合、亜鉛合金粉末表面にステアリン酸の親水部であるカルボキシル基が吸着し、外側に親油部であるアルキル基を配置する形で付着するものと思われる。したがって、粒子同士の接触点では亜鉛/アルキル基、あるいはアルキル基/アルキル基の形で接触し、このアルキル基の滑り性が高いことにより粒子同士の摩擦力が軽減され、粒子同士の滑り性が良くなり、亜鉛合金粉末の流動性が向上するものと推察される。

【0019】本発明においてステアリン酸の添加量を亜鉛合金粉末100重量部に対して0.0005~0.1重量部としたのは、0.0005重量部未満では流動性の改善効果が小さいこと、0.1重量部を超えると添加量では乾電池に組み込んだ場合、電池の内部抵抗が上昇するため放電性能に悪影響を及ぼすためである。

【0020】以下、実施例および比較例により本発明をさらに説明するが、本発明はこれらに限定されるものではない。

【0021】

【実施例】純度99.995%以上の溶融した金属亜鉛に各添加元素を表1に示す含有量となるように添加して溶解した。

【0022】次にこの溶解物をアトマイズ法により圧縮空気をガス源として噴霧し、粉体化して亜鉛合金粉末を作成した。

【0023】この亜鉛合金粉末を100~200メッシュに分離し、この亜鉛合金粉末にステアリン酸を所定量溶解させたイソプロピルアルコールを亜鉛合金粉末100重量部に対して1.0重量部添加し、混合した後、約60℃で加熱乾燥した。得られた亜鉛合金粉末について、JIS Z 2502の方法で流動性を評価し、結果を表1に示した。

【0024】

【比較例】実施例と同様に各添加元素を表1に示す含有量となるように添加してアトマイズ法により亜鉛合金粉末を作成し、100~200メッシュに分離したのについて本処理の実施例と同様に流動性を評価した。測定結果を表1に示す。

【0025】

【表1】

| 試験 番号 | 組 成 (ppa) | | | | | ステアリン酸 添加量 (重量部) | 流動度 (秒/50g) | |
|-------------|-----------|-----|-----|------|------|------------------------|----------------|----|
| | A l | B l | I n | P b | Z n | | | |
| 実 施 例 | 1 | 30 | 120 | 500 | — | 残部 | 0.0005 | 40 |
| | 2 | 30 | 120 | 500 | — | 残部 | 0.0010 | 38 |
| | 3 | 30 | 120 | 500 | — | 残部 | 0.0050 | 36 |
| | 4 | 30 | 120 | 500 | — | 残部 | 0.0100 | 34 |
| | 5 | 30 | 120 | 500 | — | 残部 | 0.0200 | 33 |
| | 6 | 30 | 120 | 500 | — | 残部 | 0.0500 | 35 |
| | 7 | 30 | 300 | 500 | — | 残部 | 0.1000 | 36 |
| | 8 | — | 500 | 500 | 500 | 残部 | 0.0200 | 35 |
| | 9 | — | 500 | 1000 | 1000 | 残部 | 0.0500 | 36 |
| | 10 | — | — | 500 | 2000 | 残部 | 0.0200 | 34 |
| | 11 | — | — | — | 3000 | 残部 | 0.0500 | 35 |
| 比 較 例 | 12 | 30 | 120 | 500 | — | 残部 | 無添加 | 56 |
| | 13 | 30 | 300 | 500 | — | 残部 | 無添加 | 66 |
| | 14 | — | 500 | 1000 | 1000 | 残部 | 無添加 | 60 |
| | 15 | — | — | 500 | 2000 | 残部 | 無添加 | 68 |
| | 16 | — | — | — | 3000 | 残部 | 無添加 | 56 |

表1の結果から分かるように、亜鉛合金粉末100重量部に対して0.0005～0.1重量部のステアリン酸を亜鉛合金粉末表面に付着させた亜鉛合金粉末の流動度は33～40秒/50gの範囲であるのに対し、未処理の亜鉛合金粉末は流動性が悪く、流動度は56～68秒/50gである。

【0026】

【発明の効果】以上説明したように、本発明の方法によ

れば、雰囲気中の酸素濃度を制御することなく圧縮空気を噴射するアトマイズ法で得られた亜鉛合金粉末を簡便な手段で亜鉛粉末表面の清り性を改善し、流動性の良い亜鉛合金粉末が得られるので、これをアルカリ電池用の負極活物質として用いれば小型乾電池の組み込み工程でのノズルの閉塞や計量性の問題が解消され、電池組み込み工程における作業性を大幅に向上できる。